

(11/17)

Chem 1054 Exam 3.

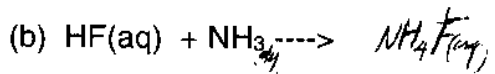
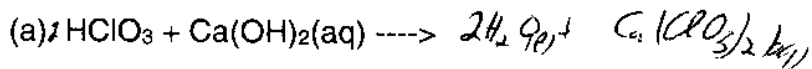
Name Key

Show all work for credit *remember phase labels*

(1)(2 points) Define the following:

- (a) Arrhenius acid *a compound that forms H^+ in water*
- (b) Arrhenius base *a compound that forms OH^- in water*
- (c) Brønsted-Lowry acid *a H^+ donor*
- (d) Brønsted-Lowry base *an H^+ acceptor*

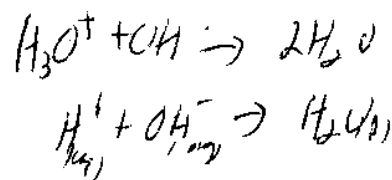
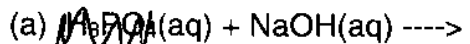
(2)(4 points) Complete the following neutralization reactions and balance them for complete neutralization (all acidic protons neutralized, all basic units neutralized).

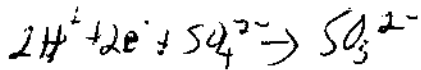
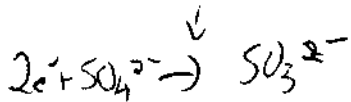
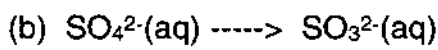


(3)(2 points) Name the following acids and bases

- (a) HNO_3 *nitric acid*
- (b) H_2SO_3 *sulfurous acid*
- (c) NH_3 *ammonia*
- (c) $HClO_2$ *chlorous acid*

(4)(4 points) Write the net acid-base reactions for the following neutralizations





$$S + 4(0) = -2$$

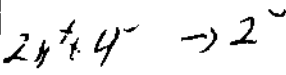
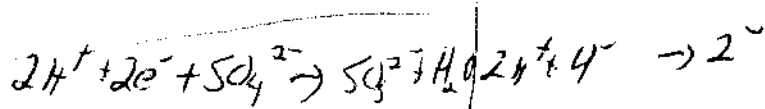
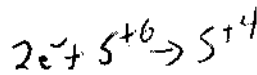
$$S - 8 = -2$$

$$S = +6$$

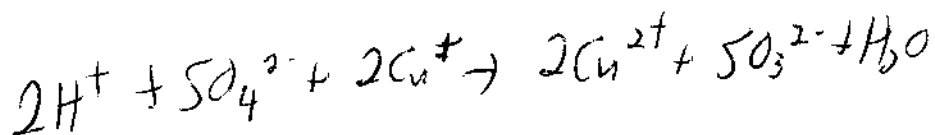
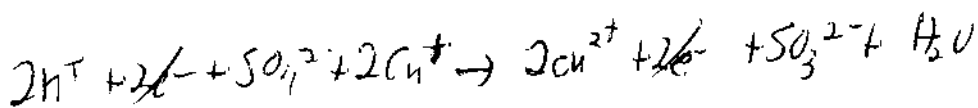
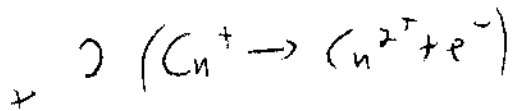
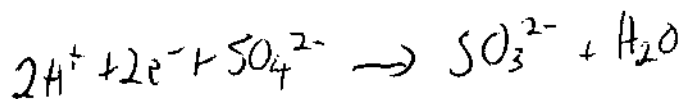
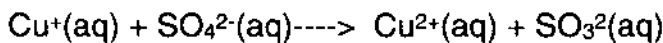
$$S + 3(0) = -2$$

$$S + 3(-2) = -2$$

$$S = +4$$

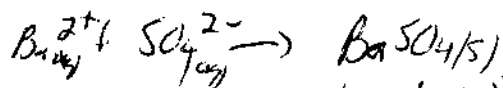


(10)(4 points) Balance the following oxidation-reduction reaction in acid



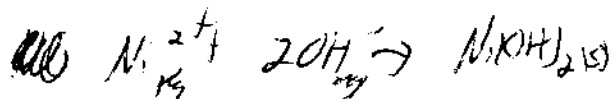
(11)(4 points) Name a reagent that you could use to separate the Ba^{2+} and Ni^{2+} from a solution of $Ba(NO_3)_2$ and $Ni(NO_3)_2$ by a precipitation. Write out the precipitation reaction and list which metal will be in the precipitate and which will be left in solution. What could you add to precipitate the metal remaining in solution?

Na_2SO_4 would precipitate Ba^{2+}

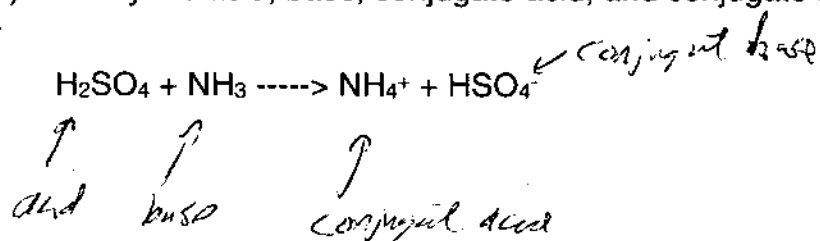


Ni^{2+} will be left in solution

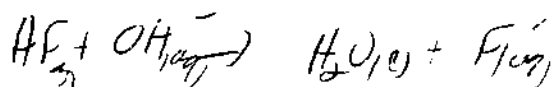
$NaOH$ would precipitate the Ni^{2+}



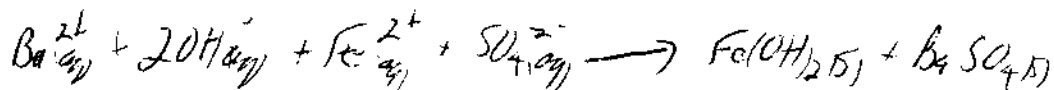
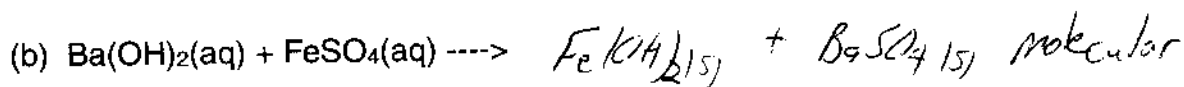
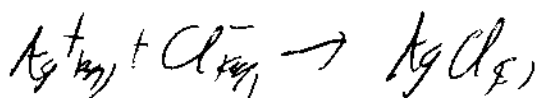
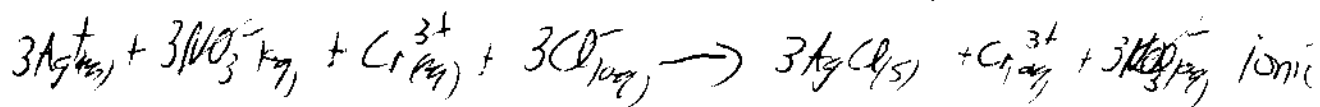
(12)(2 points) Identify the acid, base, conjugate acid, and conjugate base in the following reaction.



Extra Credit (4 points): Describe one application of redox reactions.



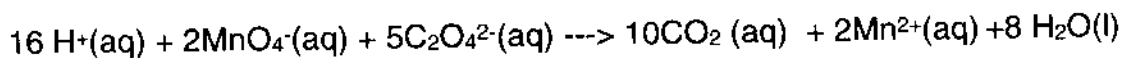
(5)(4 points) Write the molecular, ionic and net ionic equations for the following reactions



ionic & net ionic

no spectator ions

(6)(4 points) A 25.00 mL sample containing oxalate ($\text{C}_2\text{O}_4^{2-}$) was titrated with 0.100 M NaMnO_4 according to the equation below. If it took 22.10 mL of the MnO_4^- solution to neutralize the oxalate, what was the concentration of oxalate in the solution?



$$\left(\frac{0.100 \text{ mol/L}}{1}\right) (0.02210 \text{ L}) = 2.21 \times 10^{-3} \text{ mol MnO}_4^-$$

$$\left(2.21 \times 10^{-3} \text{ mol MnO}_4^-\right) \left(\frac{5 \text{ mol C}_2\text{O}_4^{2-}}{2 \text{ mol MnO}_4^-}\right) = 5.52 \times 10^{-3} \text{ mol C}_2\text{O}_4^{2-}$$

$$\frac{5.52 \times 10^{-3} \text{ mol C}_2\text{O}_4^{2-}}{0.02500 \text{ L}}$$

$$\boxed{0.221 \text{ M C}_2\text{O}_4^{2-}}$$

(7)(2 points) Label the following as strong electrolytes, weak electrolytes, or nonelectrolytes

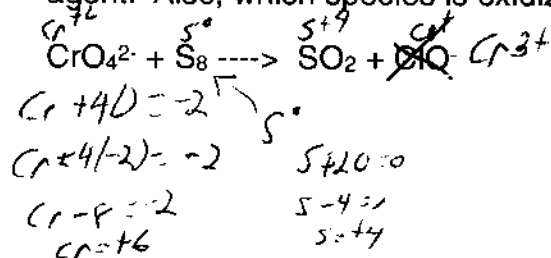
(a) $\text{CH}_3\text{CH}_2\text{OH}$ nonelectrolyte

(b) Li_2SO_4 strong

(c) NH_3 weak

(d) MgCr_2O_7 strong

(8)(4 points) For the following reaction, identify the oxidizing agent and the reducing agent. Also, which species is oxidized, and which is reduced?



CrO_4^{2-} oxidizing agent, it is reduced

S_8 - reducing agent, it is oxidized

(9)(8 points) Balance the following half-reactions in acid

(a) $\text{Cu}^+(\text{aq}) \longrightarrow \text{Cu}^{2+}(\text{aq})$

